Chapter 2
Update of the Washington Input-Output Table: Methodology and Data

The 1997 Washington Input-Output (I-O) Study adopted a non-survey based approach to update the state I-O Table. Generally referred to as the "RAS" procedure, the updating applied a bi-proportional scaling mechanism to the base-year 1987 Table to "project" an I-O Table for 1997. When some of the target year industrial production and purchases are already "known", they are treated as given/fixed values and excluded from the "RAS" balancing procedure.

The "RAS" procedure demands as much information on the "fringes" of the target year (i.e. 1997) Table to be known or estimated as possible. These fringe entries include total output, the value-added, all final demand categories, and imports and exports for the pre-defined industrial sector. Basically, they consist of components 2 and 3 of an I-O table as discussed in Chapter 1 (Table 1-1). The row and column control totals – i.e. total output or input by industry – for the target year are necessary elements for the update. The single reason why the target year was set for 1997, rather than a more recent year, is that most input data needed for this updating procedure were not available for later years when the Study was conducted. The steps that the Study followed to compile an I-O Table for 1997 are:

1. Define target-year industrial sectors.
2. Collect, compile, and estimate target-year values of the entries in the "fringe area" (i.e. components 2 and 3 of Table 1-1) of the I-O table. Also, compile data from past studies of the state industries that reveal their production and purchase patterns.
3. Apply the bi-proportional matrix balancing procedure -- RAS -- to create the target-year (1997) Table from the base-year (1987) Table.

STEP 1: Define target-year industrial sectors

Over time, new industries evolve or old industries decline in the state economy; furthermore, existing establishments may change their production processes to adapt to new technologies or to shifting markets. These changes require the re-definition of industrial sectors in the new I-O table, because in the I-O concept every industrial sector is assumed to be homogeneous, meaning all establishments in the industry have a similar production process or input/purchasing pattern. Empirically, limitations in data availability may force the adoption of more aggregate industrial sectors. After all these considerations, a sectoring plan for the 1997 Table was defined, as shown in Table 2-1.

Table 2-1a 1997 WASHINGTON INPUT-OUTPUT STUDY SECTORING PLAN (SIC)	
Industry Name	**SIC Code**
1. Field crops, fruits, and vegetables	01
2. Livestock and products	02
3. Fishing and forestry	08, 09 (inc. state forests, etc.)
4. Mining	10-14
5. Food products	20
6. Textiles and apparel	22-23
7. Lumber and wood products	24
8. Furniture and fixtures	25
9. Pulp and paper products	26
10. Printing and publishing	27
11. Chemicals and products	28
12. Petroleum and products	29
13. Stone, clay, and glass products	32
14. Primary metals	33
15. Fabricated metals	34
16. Industrial machinery and equipment	35
17. Electrical machinery	36
18. Aircraft and parts	372, 376
19. Ship and boat building and repair	373 (inc. Puget Sound Naval Shipyard)
20. Other transportation equipment	371, 374, 375, 379
21. Instruments	38
22. Other manufacturing	30, 31, 39
23. Construction	15-17
24. Transportation services	40-47 (inc. Post Office, etc.)
25. Electric utilities	491, pt. 493 (inc. BPA, etc.)
26. Gas utilities	492, pt. 493 (inc. municipal utilities)
27. Other utilities	Pt. 493, 494-497 (inc. public utilities)
28. Communications	48
29. Wholesale trade	50, 51
30. Eating and drinking places	58
31. Other retail trade	52-57, 59 (inc. state liquor stores)
32. Finance and insurance	60-64, 67
33. Real estate	65
34. Hotels and lodging	70
35. Computer and data processing services	737
36. Business and professional services	Pt. 73, 81, 87, 89
37. Health services	80
38. Other services	07, 097, 72, 75-79, 82-84, 86, 88

Table 2-1b 1997 WASHINGTON INPUT-OUTPUT STUDY SECTORING PLAN (NAICS)	
Industry Name	**NAICS Code**
1. Crop production	111
2. Animal production	112
3. Forestry and fishing	1131, 1132, 114 (incl. state forests, etc.)
4. Logging	1133
5. Mining	21
6. Electric utilities	2211 (incl. public)
7. Gas utilities	2212 (incl. public)
8. Other utilities	2213 (incl. public)
9. Construction	23
10. Food manufacturing	311, 312
11. Textiles and apparel manufacturing	313, 314, 315
12. Wood product manufacturing	321
13. Paper manufacturing	322
14. Printing	323
15. Petroleum and products manufacturing	324
16. Chemical manufacturing	325
17. Nonmetallic mineral products manuf.	327
18. Primary metals manufacturing	331
19. Fabricated metals manufacturing	332
20. Machinery manufacturing	333
21. Computer and electronic product manuf.	334
22. Electrical equipment manufacturing	335
23. Aircraft and parts manufacturing	3364
24. Ship and boat building	3366 (incl. federal)
25. Other transportation equipment manuf.	3361, 3362, 3363, 3365, 3369
26. Furniture and related product manuf.	337
27. Other manufacturing	316, 326, 339
28. Wholesale trade	42
29. Retail trade	44, 45 (incl. state liquor stores)
30. Transportation and warehousing	48, 49 (incl. post offices, etc.)
31. Information	51
32. Finance and insurance	52
33 . Real estate	53
34. Professional services and management	54, 55, 56
35. Educational services	61
36. Health services	62
37. Arts, recreation, and accommodation	71, 721
38. Food services and drinking places	722
39. Other services	115, 81

STEP 2: Compile the target-year data and information on Washington industries

Data on 1997 industrial output, value-added, government expenditures, consumption of Washington residents, capital (investment) spending, and external trade (exports and imports) were compiled. Sometimes industrial details can only be derived through inferring, interpolating or extrapolating from available, but more aggregate, estimates. Table 2-2 shows the data categories and the respective data sources.

Table 2-2
Input Data for the Target Year (1997)

Data Categories	Data Sources
Industrial Output	1997 Economic Census – Industrial shipment$. Washington Dept. of Agriculture - Annual agricultural production by crop type. Washington Dept. of Revenue - Gross Business Income reports. Bureau of Economic Analysis - 1997 U.S. Input-Output (Use) Table.
Value Added	Bureau of Economic Analysis - Gross State Product. Bureau of Economic Analysis - labor earnings series. Washington Employment Security Department - ES202 Wage and Salaries series.
Personal Consumption Expenditures	Bureau of Economic Analysis – National Income and Product Accounts. Bureau of Economic Analysis - State personal income series. Washington Department of Trade and Economic Development – Study of travelers' impact on the state economy.
Government Spending	Census Bureau's State and Local Government Expenditures series. Census Bureau's Federal Government Expenditures reports. Washington Office of Financial Management – State government expenditures accounting records.
Investment	Census Bureau's Building Permit report. Washington Dept. of Revenue - Abstract of County Assessed Values report. Washington Dept. of Revenue - taxable sales database. Bureau of Economic Analysis - 1997 U.S. Input-Output (Use) Table.
Exports & Imports	The Massachusetts Institute for Social and Economic Research's (MISER) export database. Census Bureau's 1997 Commodity Flow Survey. Washington Department of Trade and Economic Development – study of travelers' impact on the state economy; and studies of the impact of foreign exports and imports on the state economy.

The bi-proportional scaling procedure is a purely computational matrix balancing routine, no concept of economic changes is involved. So to obtain a more accurate target-year Table that captures some important economic changes from base year to target year, efforts were made to incorporate as much "known" information in the Table as possible. One channel of obtaining information about production and sales of local industries is to "borrow" results from relevant past special studies on Washington industries. Information from the recent empirical studies on several critical Washington industries such as business services (including software publications), aerospace, and tourism-related trade and services were compiled and incorporated in the new 1997 Table.

STEP 3: Create the 1997 Table Using the "RAS" Procedure

The RAS procedure factors up or down, in iterative inter-locked steps, rows and subsequently columns of the base-year (1987) I-O Table to match the target-year (1997) industrial (output) control totals. The "known" entries from data collected in the proceeding step were held fixed during the table adjustment and matrix balancing process; in other words, the scaling process only applied to the "unknown" parts of the Table.

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